Remarks/Arguments

Specification

Please amend the present application by replacing Paragraph [0010] and the Abstract as detailed in the "Amendments to the Specification" of this response. Paragraph [0010] is amended merely to correct a typographical error. The Abstract is amended merely to correct a clerical error. No new material has been introduced.

Drawings

Examiner:

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature specified in the claims. Therefore, the electronic component must be shown or the feature(s) cancelled from the claim(s).

Response:

Please amend the present application by replacing Fig.3 with a replacement Fig.3 as detailed in the "Amendments to the Drawings" section of this response. Support for the newly added electrical components can be found in Paragraph [0010]. No new material has been introduced.

Claim Rejections

Examiner:

Claims 1-5 and 8-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Pollard II (U.S. Patent No. 6,260,613). Claims 6-7 are rejected under 35 U.S.C. 103 as being unpatentable over Pollard II in view of Endo [(US 4,415,118)]. The patent of Pollard II discloses all the claimed features with the exception of the casing being electrical and thermally insulating. The patent of Endo discloses that it is known to have an electrical and thermally insulating casing for the purpose of preventing the environment from effecting the thermal exchange between the PCM and pipe.

Response:

The disclosure of Pollard II (Col.2 line 62 to Col.3, line 3) states : "As shown in FIG.2 the temperature of the two phase material 32 and the integrated circuit 12 remain relatively constant while the material is changing phase. At some point the entire two-phase material 32 changes to liquid phase at which point the temperature of the material 32 and the integrated circuit 12 will again raise during the power burst. It is desirable to provide enough two-phase material 32 to insure that the entire material never completely changes phase." Including enough two-phase material "to insure that the entire material never completely changes phase" is the disclosed solution to this problem and by its very nature requires the heat storage unit to be larger than what is necessary in all conditions.

In accordance with the present invention's stated goal of a "smaller thermal module designed around a reasonable thermal target to provide adequate thermal protection", claim 1 has been amended to include the limitation of "the heat storage comprising a plurality of types of phase change materials for heat storage that change from one physical state to another physical state at differing temperatures". This limitation is supported by Paragraph [0031] of the present application. No new material has been introduced.

The utilization of a plurality of types of PCMs that change phase at differing temperatures is a different solution to the problem. While the temperature within the system may climb somewhat after the first PCM has changed phase, a second type of PCM having a higher melting point will prevent system damage by beginning to change phase. A progression of PCMs having higher and higher melting points may result in a smaller thermal module while providing adequate protection during system heat bursts.

The Applicant is unable to find any suggestion in the cited prior art of a thermal module's heat storage unit having a plurality of PCMs having differing melting temperatures. As stated, this change in structure will have a real-world change in results and is therefore believed to be new, useful, and non-obvious.

Concerning claims 6 and 8-13 which depend upon amended claim 1 and claim 14, the Examiner has stated that Pollard II does not disclose the present invention's limitation of the casing being electrically and thermally insulating.

However, the Examiner continues, Endo discloses that it is known to have an electrical and thermally insulating casing for preventing the environment from effecting the thermal exchange between the PCM and the pipe.

Endo discloses a rapid warm-up spot heater for a motor vehicle rather than a thermal module for a laptop computer. When the goal of the disclosure is to use a "heat accumulating material" to accumulate and retain as much 350-750 degree Celsius heat as possible in an environment assumed to have a sub-zero temperature for 10 hours (Col.3, lines 33-54), it is understandable to include a thermally insulating layer around the heat accumulating material. However, without hindsight afforded by the present application, the Applicant is unable to locate in the disclosure of Endo any teachings, suggestion, or motivation for providing an electrically insulating casing for the heat accumulating material. MPEP 2131 and 2143 both explicitly state that a reference (or combination of references) must teach or suggest all of the claim limitations.

The electrical insulation is important to the present invention because it allows the PCM to be "placed in small areas between the electrical components, occupying no more than what is normally wasted space" (Paragraph [0010]). The limitation of the casing being electrically insulated is not taught or suggested in either Pollard II or Endo.

Therefore, for at least the above reasons, the Applicant believes the present invention as claimed represents a new and useful device not taught or suggested

in the prior art and respectfully requests reconsideration of amended claims 1-14.

Introduction of New Claims

Please amend the present application with the inclusion of new claims 15-17. Supported by Paragraphs [0027]-[0030], independent claim 15 includes the electrically insulating casing and relates the maximum size of the heat sink to the temperature at which the phase change material shifts phase, allowing a reduction in the size of the heat sink. Claim 16 introduces a second PCM within the casing and claim 17 limits types of PCMs. No new material has been introduced. The Applicant believes that claims 15-17 represent a new and useful device not taught or suggested by the prior art and therefore respectfully requests acceptance, consideration, and swift allowance of claims 15-17.

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